ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 11, November 2017

# Intelligent Controller to Monitor and Control Physical Parameters in Greenhouse.

[1] Santha Moorthy S, [2] Punith kumar, [3] Njayanth S, [4] Vishal.S.Shabadi, [5] Prajwal H M
Sri Sairam college of engineering Bangalore, Karnataka

***Abstract:*** **- The greenhouse needs the monitoring of the parameters like temperature, humidity and light. These parameters should be kept within the specified range. All these real time parameters are measured and sent to coordinator through Zigbee. As an open and global standard for wireless sensor network Zigbee protocol, IEEE 802.15.4 shows the advantages on low cost, low power consumption and low data rate. Zigbee's network layer supports three networking topologies star, mesh, and cluster tree. Star networks are common and provide for very long battery life operation. Zigbee based wireless monitoring and control system in the greenhouse is composed of a coordinator and end devices, including sensor nodes and electrical devices organized as a star network. By running the software, the coordinator periodically receives the data from the wireless sensor nodes and displays them on its LCD. Meanwhile, it sends orders to electrical devices in the network to control them automatically.**

***Keywords:*** **Greenhouse, Zigbee, WSN, FFD, RFD.**

## I. INTRODUCTION

We live in a world where everything can be controlled and operated automatically, but there are still a few important sectors in our country where automation has not been adopted or not been put to a full-fledged use, perhaps because of several reasons one such reason is cost. One such field is that of agriculture. Agriculture has been one of the primary occupations of man since early civilizations and even today manual interventions in farming are inevitable. Greenhouses form an important part of the agriculture and horticulture sectors in our country as they can be used to grow plants under controlled climatic conditions for optimum produce. Automating a greenhouse envisages monitoring and controlling of the climatic parameters which directly or indirectly over on the plant growth and hence their produce. Automation is process control of industrial machinery and processes, thereby replacing human operators.

### A. Necessity

The two major life-processes occurring in plants are photosynthesis and transpiration. Photosynthesis is the conversion of light energy into chemical energy by living organisms. The raw materials are carbon dioxide and water; the energy source is sunlight and the end- products are oxygen and (energy rich) carbohydrates, for example sucrose, glucose and starch. This process is arguably the most important biochemical pathway, since nearly all life on Earth either directly or indirectly depends on it.

### B. Photosynthesis

Light energy obtained from the sun is very essential for photosynthesis. The photons present in light are responsible for triggering the light-reaction in plants. Plants need an optimum amount of exposure to light in a day. This optimum period is called its photo- period. The plant sensitivity curve for photosynthesis has its peak at the red side of the spectrum. This indicates that providing plants with the wavelengths best suited to photosynthesis is most efficient with the use of artificial light. Tests how a mean deviation from the average sensitivity curve of less than 5% for a wide variety of plants. The curve shows that the maximum sensitivity for photosynthesis lies in the far red at approximately 675 nm. The plant sensitivity curve disputes two common misconceptions. The first is that an "ideal" plant growing lamp duplicates the spectral energy distribution of the sun. sunlight has a continual spectrum, radiating energy in wavelengths that contribute less to photosynthesis, and are therefore wasted" on the plant. For this reason, many lamps are more efficient than sunlight for plants.

### C. Transpiration

Transpiration is the evaporation of water from the aerial parts of plants, especially leaves but also stems, flowers and roots Transpiration also cools plants and enables mass flow of mineral nutrients and water from roots to shoots. Mass flow is caused by the decrease in hydrostatic (water) pressure in the upper parts of the plants due to the diffusion of water out of stomata into the atmosphere. Water is absorbed at the roots by osmosis, and any dissolved mineral

ISSN (Online) 2394-6849

International Journal of Engineering Research in Electronics and Communication Engineering (IJERECE)
Vol 4, Issue 11, November 2017

nutrients travel with it through the xylem.The rate of transpiration is directly related to the degree of stomatal opening, and to the evaporative demand of the atmosphere surrounding the leaf. The amount of water lost by a plant depends on its size, along with the surrounding light intensity, temperature, humidity, and wind speed (all of which influence evaporative demand). Soil water supply and soil temperature can influence stomatal opening, and thus the transpiration rate.

## II. SYSTEM DESIGN

A number of problems associated with the above mentioned systems are enumerated as below: 1. Complexity involved in monitoring climatic parameters like humidity, soil moisture, illumination, soil pH, temperature, etc which directly or indirectly govern the plant growth. 2. Investment in the automation process are high, as today_s greenhouse control systems are designed for only one parameter monitoring (as per GKVK research center); to control more than one parameter simultaneously there will be a need to buy more than one system. 3. High maintenance and need for skilled technical labor. The modern proposed systems use the mobile technology as the communication schemes and wireless data acquisition systems, providing global access to the information about one_s farms. But it suffers from various limitations like design complexity, inconvenient repairing and high price. Also the reliability of the system is relatively low, and when there are malfunctions in local devices, all local and data will be lost and hence the whole system collapses. More over farmers in India do not work under such sophisticated environment and find no afford the same.The parameters which we want to measure are physical parameters (i.e in non –electrical form).So as to convert it into electrical form we are using sensors. The output of sensor is in analog in nature, to convert it into digital form we apply it to DC which is inbuilt in PIC controller. The converted digital output of sensor is analyzed by controller for taking proper action. After that controller ask Zigbee module it is ready or not. Then controller sends these data through SPI to Zigbee transceiver .The information is send to master module. It will receive it and decodes it. Then give it to PIC controller and according to information is received, will display on LCD. If we want to switch off any process for example if temperature is more than set point then master will send command to slave to witch off the fan that is to take necessary action. In this way bidirectional communication takes place.

**A. Comparision of Wireless Technologies**:

Wi-Fi, Bluetooth and ZigBee work at similar RF frequencies, and their applications sometimes overlap (Seager, 2006). In the current study, we chose the following five main factors of greenhouse etworks to compare: cost, data rate, number of nodes, current consumption and battery life. 1] Cost: ZigBee chip is US$ 1 or less, the lowest; Wi-Fi and Bluetooth chips are $ 4 and $ 3, respectively. The overall system cost can be significantly reduced by the employment of ZigBee chip. 2] Data rate: ZigBee is 250 kbps, while Wi-Fi and Bluetooth are 54 Mbps and 1~2 Mbps, respectively. ZigBee is sufficient for a greenhouse. Generally, data traffic in a greenhouse is low—usually small message such as the change of temperature or a command from the controller or an actuator. And also, low data rate helps to prolong the battery life. 3] Number of nodes: The capacity of network is determined by the number of nodes, and ZigBee has up to 254 nodes, the largest on the three. It meets the application demand of more and more sensors and actuators in a greenhouse. 4] Current consumption: ZigBee has the lowest current consumption, 30 mA, while Wi-Fi, 350 A, and Bluetooth, 65~170 mA. It also greatly helps to prolong the battery life. 5] Battery life: ZigBee chip has the longest battery life, few months or even years. As a whole, ZigBee technology offers along battery life, small size, high reliability, automatic or semiautomatic installation, and, particularly, a low system cost. Therefore, it is a better choice for greenhouse monitoring and control than other wireless protocols.

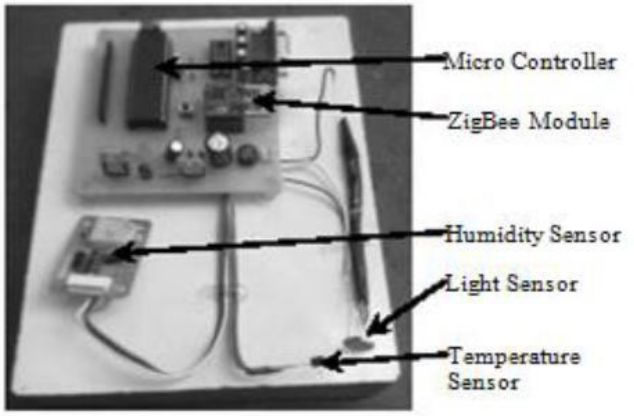


*Fig. 2 Hardware Implementation of Transmitter*

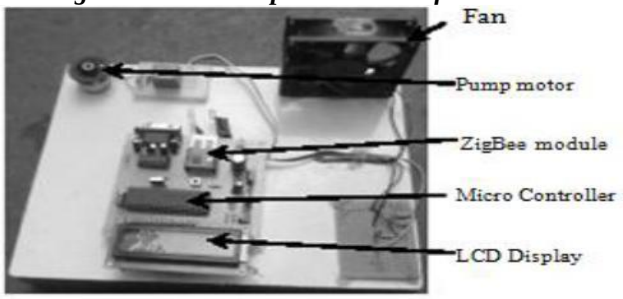


*Fig. 3 Hardware Implementation of receiver*

## III. RESULTS

An experiment has done to record the Temperature, Humidity and Light intensity readings in greenhouse. The reason for this experiment is to make sure that the system that was design is functioning well and the data can record correctly.

## IV. CONCLUSION

Greenhouse prevents the plant from the effects of climate; inspect and so on, which makes great sense for agricultural production. The automation and high efficiency on greenhouse environment monitoring and control are crucial. Applying ZigBee-based WSN technologies to greenhouses is a revolution for protected agriculture which overcomes the limits of wire connection systems. Such a system can be easily installed and maintained. In this we discussed the wireless solution of greenhouse monitoring and control system based on ZigBee technology, and designed the wireless nodes, network establishment and control system. With the capabilities of self-organizing, self-configuring, self-diagnosing the ZigBee based monitoring and control system provides nearly unlimited installation flexibility for transducers, increases network robustness, and considerably reduces costs. We therefore, conclude that the ZigBee based monitoring and control system can be a good solution for greenhouse monitoring and control.

## REFERENCES

[1] Anujkumar, ―Prototype Greenhouse Environment Monitoring System‖, ‗Proceeding of International Multiconference of Engineers and Computer Scientists', 2010, Vol. 2, Page 1-5.

[2] D.D. Chaudhary. S. P. Nayse, L. M. Waghmare, ―Application of Wireless Sensor Networks for Greenhouse Parameters Control in Precision Agriculture‖, ‗International Journal of Wireless & Mobile Networks',Feb 2011,Vol.3 No. 1,Page 140-149.

[3] B. P. Ladgaonkar, A.M. Pawar, ―Design and Implementation of Sensor Node for Wireless Sensor Network to monitor Humidity of High-tech Polyhouse environment ‖, ‗International Journal of Advances in Engineering & Technology (IJAET)',2011,Vol.1,Issue 3,Page 1-1

[4] Dargie W. and Poellabauer, ―Fundamental of Wireless Sensor Networks: Theory and practice‖, John Wiley and Sons, 2010, Page168-183.

[5] Leong Born Tik, ChanToong Khaun and Palanippan, ―Monitoring of an Aeroponic Greenhouse with a sensor Network‖, ‗International Journal of Computer Science and Network Security', March 2009, Vol.9, No.3, Page 240-246.

[6] SUN RONG-GAO, SUN DE-CHAO, ―Greenhouse Temperature and Humidity Intelligent Control System‖, ‗Proceeding of 3rd WSEAS International Conference on Circuits, Systems, Signal and Telecommunication'2009, Page 120-125.

[7] Wen-Tsai Sung, Ming-Han Tsai, ―Multisensor Wireless Signal Agggregation for Environmental Monitoring System via Multibit Data Fusion‖,' International Journal Applied mathematics and Information Sciences',2011,Vol.5,No.3, Page 589-603.